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SmartRoute
SYSTEMS

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RECEIVED

October 3, 1996

OCT 4 1996

VIA MESSENGER

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: Ex Parte Presentation
CC Docket 92-105

Dear Mr. Caton:

On behalf of SmartRoute Systems and pursuant to Section 1.1206(a) of the Commission's Rules, this will constitute notice that on October 2, 1996, Eli Sherer, Vice President of Operations at SmartRoute Systems, Paul Najarian, Senior Telecommunications Engineer at ITS America, George Beronio of the Joint Program Office in the Department of Transportation, Robert B. Kelly and Katherine S. Poole of Kelly & Povich, P.C., counsel to ITS America, met with Elizabeth S. Nightingale, Attorney in the Network Services Division, Anne F. Bisese, Electronics Engineer in the Common Carrier Bureau, Kent R. Nilsson, Deputy Chief of Policy in the Network Services Division, and Mary DeLuca, Engineer regarding the possibility of reserving an N11 number nationwide for Advanced Traveler Information Systems. The attached materials were distributed at the meeting.

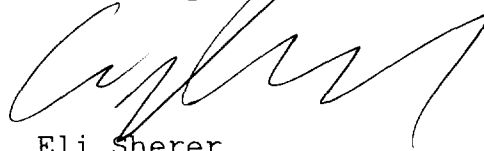
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022

Mr. William F. Caton
April 7, 1995
Page 2

Two copies of this notice are submitted herewith pursuant to Section 1.1206(a)(1) of the Rules. Should there be any questions on this matter, kindly communicate with this office.

Sincerely,

A handwritten signature in black ink, appearing to read 'Eli Sherer', with a long, sweeping horizontal stroke extending to the right.

Eli Sherer

cc: Elizabeth S. Nightingale
Anne F. Bisese
Kent R. Nilsson
Mary DeLuca

SmartRoute

S Y S T E M S ►

**Innovative Solutions For
Intelligent Transportation Systems**

**The easiest way
to get where you
want to go.**

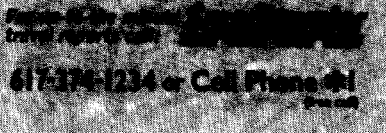
**GET
THERE**
GUIDE

Cell Phone

*1 {free call}

617-
374-1234

1-800-FLY-
GARB



ROUTE	CODE
Route 1/Tobin Bridge	1*
Route 2	2*
Route 3	3*
Logan Airport/Tunnels	
Parking/Massport Info.	5*
Downtown Boston	
Central Artery	6*
Cape Cod/	
Steamship Authority	7*
MBTA	8*
Route 9	9*
Route 24	24*
Mass Pike	90*
Route 93	93*
Route 95	95*
Route 128	128*
Route 495	495*

SmarTraveler is sponsored by The Mass. Dept. of Transportation

Every day, more smart drivers call SmarTraveler, free, because it's the easiest way to get up-to-the-minute traffic information when you need it most – fast and route-specific.

With a network of remote cameras, sensors, mobile units, aircraft, and more, SmarTraveler keeps on top of the latest traffic conditions to help you choose the best route and time to make your travel easier. Plus, through SmarTraveler, you can now access Massport, MBTA, Caravan and the Central Artery information lines.

New! SmarTraveler Online: www.smartraveler.com, or America Online, keyword: smartraveler



For up-to-the-minute traffic reports.



100 offices coast-to-coast, London & Toronto.

The Only Way To Go.

SmarTraveler is sponsored by
The Massachusetts Department of Transportation



3 Free Ways To Avoid Traffic Around Cincinnati

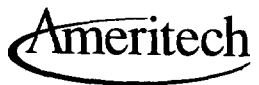
SmartTraveler

Sponsored by:

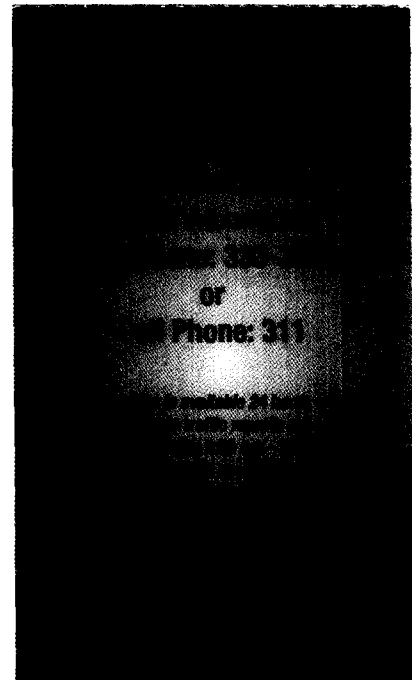


Kentucky Transportation Cabinet
Ohio Department of Transportation
OKI Regional Council of Governments

In Cooperation with:



CELLULARONE®



SmartTraveler

The  **One-Of-A-Kind Traffic Service**
That's Free...Just Think Three!

1 Call Says It All

Up-to-the-minute, route-specific information for traffic, transit, and road conditions in and around Cincinnati. With our network of TV cameras, aircraft, mobile units and more, **SmartTraveler** can help you decide on the right time and best route for you. Also call **SmartTraveler** to get a direct link to TANK, METRO, Jetport and Ride Share. With **SmartTraveler**, it's one and it's done!

2 Easy Ways To Call

By telephone, call **SmartTraveler** before you leave your home or office. By cell phone, Ameritech or Cellular One, call to get traffic info when you're on the road. The good news is that with **SmartTraveler** you get your specific route information the moment you need it. And the great news is that whether you are calling from home, office, or the road the call is absolutely free!

3 Is The Magic Number

Reaching **SmartTraveler** is easy. From your telephone, just dial 333-3333. From your cell phone, just punch in 311. Once connected to **SmartTraveler**, just enter the code for your specific transportation need. **SmartTraveler**, easy to use, easy to remember: by telephone, 333-3333 or by cellular, 311...just Think Three!

SmartTraveler

Telephone: 333-3333
or Cell Phone: 311

ROUTE	PRESS
I-275	
I-74	74*
I-471	
R. Reagan/Cross	
County Highway	774*
Norwood Lateral	
I-75	75*
I-71	
D-town Cincinnati	1*
Queen City Metro Info	
TANK Bus Info	92*
Jetport Limo Info	
Ride Share Info	94*
Transportation to	
Special Events	

SmartTraveler is sponsored by the Kentucky Transportation Cabinet, the Ohio Department of Transportation, and the OKI Regional Council of Governments

SmartTraveler

The  **One-Of-A-Kind Traffic Service That's Free...Just Think Three!**

Just call 333-3333 or 311 on your cellular phone. Calls are free for Ameritech cellular phone customers. Calls are free for Cellular One customers through September 30, 1995. Just punch in the codes, for the routes you travel, to get up-to-the-minute traffic and transit information.

SmartTraveler is available 24 hours a day!

- Up-to-the-minute traffic reports are available:
Monday - Friday 6:00 am - 7:00 pm.
- Construction and event information are available 24 hours a day.
- Direct link to TANK, METRO, Jetport, Ride Share information lines.

APRIL

SUN	MON	TUE	WED	THU	FRI	SAT
	T 1 TEX 4:05	2	N 3 TEX 8:35	T 4 TEX 8:35	N 5 KC 2:35	N 6 KC 2:35
T 7 KC 2:35		9				
		N 16 BAL 7:35	N 17 BAL 7:35	N 18 BAL 3:05	T 19 CLE 7:05	T 20 CLE 1:05
T 21 CLE 1:05	T 22 MIN 8:05	N 23 MIN 1:15				
	29					

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
				2		
	8 PAWT 6:05	T 7 MIL 8:05	N 8 MIL 8:05	N 9 MIL 1:15	T 10 TOR 7:35	T 11 TOR 1:05
T 12 TOR 1:05	13			16		
					T 24 CAL 10:05	T 25 CAL 10:05
T 26 CAL 4:05	T 27 OAK 4:05	N 28 OAK 10:05	N 29 OAK 10:05	N 30 SEA 10:05	T 31 SEA 10:05	

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
						F 1 SEA 4:05
T 2 SEA 4:35	3					
	T 10 CHI 8:05	N 11 CHI 8:05	N 12 CHI 2:05			
	17	T 18 CLE 7:05	N 19 CLE 7:05	N 20 CLE 7:05	T 21 TEX 8:35	T 22 TEX 8:35
23 TEX 8:35	24					

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
	T 1 NY 7:35	T 2 NY 7:35	N 3 NY 1:05	T 4 BAL 4:05	T 5 BAL 7:35	F 6 BAL 1:05
E 7 BAL 8:05	8	9	10	T 11 DET 7:05	T 12 DET 7:05	T 13 DET 7:05
T 14 DET 1:15						
				N 25 MIN 8:05	T 26 MIN 8:05	N 27 MIN 8:05
T 28 MIN 2:05	29	N 30 KC 8:05	N 31 KC 8:05			

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
				N 1 KC 8:05		
					T 9 MIL 8:05	T 10 MIL 8:05
T 11 MIL 2:05	T 12 TOR 7:35	T 13 TOR 7:35	N 14 TOR 7:35	15		
	N 26 CAL 10:05	N 27 CAL 10:05	N 28 CAL 10:35	29	T 30 OAK 9:15	T 31 OAK 9:05

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
T 1 OAK 4:05	T 2 SEA 8:05	N 3 SEA 10:05	N 4 SEA 10:35	5	T 6 CHI 8:05	T 7 CHI 7:05
T 8 CHI 2:05				12		
	16	T 17 DET 7:05	N 18 DET 7:05	N 19 DET 1:15	T 20 NY 7:35	T 21 NY 1:05
E 22 NY 8:05	23					
	30					

■ Home Games

T=TV68

N=NESN

E=ESPN

F=FOX

All times are Eastern and subject to change.

TICKET PRICES: Upper Box: \$18.00
Reserved Grandstand: \$14.00 • Bleachers: \$9.00

ADVANCE TICKET SALES

BY MAIL:

- Specify date of game(s) and number of tickets.
- Make check or money order payable to "Boston Red Sox." Add \$3 shipping/handling.
- For payment by Discover, MasterCard or VISA include name, card number, expiration date, signature and daytime phone number.
- Mail to Boston Red Sox Ticket Office, 4 Yawkey Way, Boston, MA 02215-3496.

BY PHONE/FAX: [Charge only]

- **LESS THAN 40 TICKETS:** (617) 267-1700.
- **40 OR MORE TICKETS:** (617) 262-1915.
- **FAX the Ticket Office at:** (617) 236-6640.
- **TDD#:** (617) 236-6644.

IN PERSON:

- Visit the Red Sox Ticket Office, 4 Yawkey Way, Boston, MA.
- Visit the Red Sox Clubhouse Shops at: Burlington Mall (Burlington, MA) and Emerald Square Mall (North Attleboro, MA).

FANS WITH DISABILITIES:

Tickets are available at the Red Sox Ticket Office (617) 267-1700 at least 72 hours in advance for physically disabled or visually impaired. Listening devices for the hearing impaired are available at the Customer Service Booths at Fenway Park.

MAIL ORDER TICKET REQUEST

DATE OF GAME	UPPER BOX \$18.00	RES. GRAND \$14.00	BLEACHERS \$9.00	TOTAL
				\$3.00
<i>*Shipping & Handling</i>				TOTAL

The Red Sox reserve the right to limit the number of tickets purchased on specific dates.
Orders will be filled with the best available seats at the time order is received.

☐ Check here if you do not wish to receive substitute seating.
☐ Check here if you desire seating in the "No Alcohol" section (Left Field Grandstand).
All seating areas at Fenway Park are smoke-free.

SmartTraveler

Up-to-the-minute travel reports
from home, office, and car

2 Easy Ways to Dial

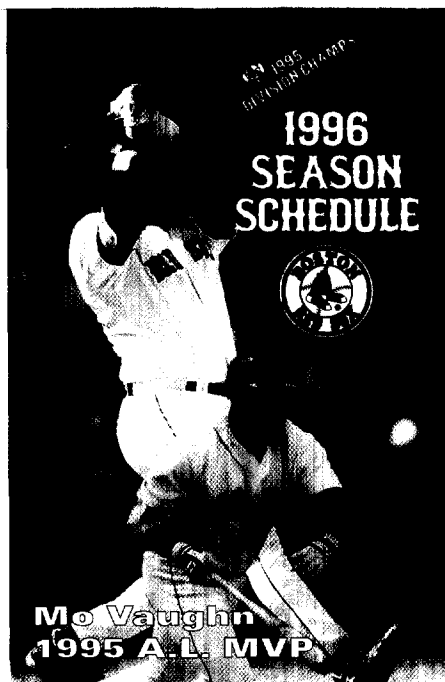
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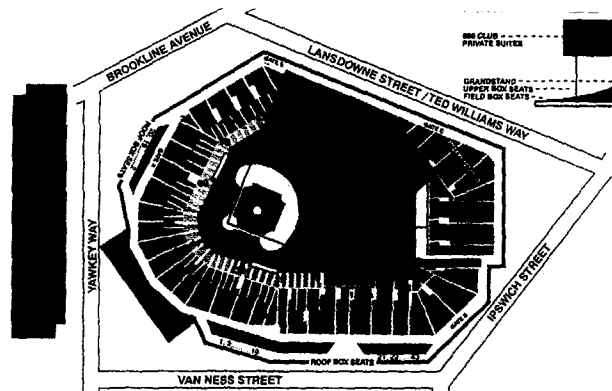
from any touch-tone phone

***1**

from any cellular phone
(no airtime charges apply)

*A free service sponsored by
Massachusetts Dept. of Transportation*





Field Box.....	\$ 23.00	Right Field Roof Box.....	\$ 18.00
Infield Roof Box.....	\$ 20.00	Grandstand.....	\$ 14.00
Upper Box.....	\$ 18.00	Bleachers.....	\$ 9.00

1996 PROMOTIONS

JULY 24
Wed. vs. KC
7:05 p.m.
MAJOR LEAGUE BASEBALL MAGAZINE FOR KIDS DAY. The First 15,000 fans age 15 and under will receive a Major League Baseball for Kids Magazine.

SEPT. 9
Mon. vs. MIL
7:05 p.m.
MAJOR LEAGUE BASEBALL MAGAZINE FOR KIDS DAY. The First 15,000 fans age 15 and under will receive a Major League Baseball for Kids Magazine.

SEPT. 13 & 14
SOX vs. CHI
Fri. 7:05 p.m.
Sat. 1:05 p.m.
RED SOX/COCA COLA FAN APPRECIATION DAYS
All fans will receive a 1996/1997 Red Sox Calendar compliments of Coca Cola.

NAME: _____

ADDRESS: _____

CITY: _____

STATE: _____ ZIP: _____

PHONE: (H) () (W) ()

Please Charge My: ☐ Discover ☐ MC ☐ VISA

Card No. _____

Exp. Date: _____ Signature _____

SEND TO: BOSTON RED SOX TICKET OFFICE
4 YAWKEY WAY, BOSTON, MA 02215-3496



For Release: Sept. 12, 1996
Contact: Dominic Slowey
(617) 742-7077
John Rourke
(617) 494-8100

SMARTROUTE SYSTEMS ANNOUNCES \$7 MILLION CAPITAL INVESTMENT

SmartRoute Systems today announced it has closed a transaction with 21st Century Communications Partners, L.P., Wheatley Partners, L.P., and Gabelli Multimedia Partners that provides a \$7 million capital investment in the firm.

21st Century Communications Partners, an affiliate of Sandler Capital Management, headed the investment group. 21st Century is an investment partnership with \$240 million of assets, specializing in media, entertainment, and telecommunications related investments.

The investment will enable SmartRoutes to deploy its SmarTraveler information system in new markets, build a second generation system architecture for its traveler information command centers, and design new product offerings for Internet delivery and in-vehicle navigation devices.

Commenting on the investment, Michael J. Marocco, Managing Director of Sandler Capital Management, said: "SmartRoute Systems is at the leading edge of generating traveler information, enabling users to commute more efficiently, and save time and money. In addition, SmartRoute Systems' data base can be leveraged through multiple distribution outlets. With a talented and savvy management team to maximize these opportunities, we look forward to an exciting future."

Added Francine Sommer, General Partner of Gabelli Multimedia Partners: "Gabelli Multimedia invests in companies that are in the early stages of growth in markets that are already established. We view SmartRoutes as being at the inflection point of the growth curve in the intelligent travel information market. SmartRoutes has a distinctive public-private business model that capitalizes on providing real-time information through various traditional and new media distribution channels in both the public and private sectors."

-more-

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141 Portland Street, Suite 8100
Cambridge, Massachusetts 02139
617 494-8100 Fax 617 494-8186

SmartRoutes collects, processes, and delivers a broad range of traveler information to consumers through existing and evolving electronic media, including cellular phone, on-line services, paging devices, landline telephone, and cable TV. SmartRoutes is most widely recognized for its SmarTraveler audiotext service, a state-of-the-art Advanced Traveler Information System (ATIS), which disseminates real-time, route specific travel and traffic information. SmarTraveler is already fully deployed in the Boston and Cincinnati metropolitan areas.

“Teaming with these three industry leaders is an important step in the development of this company,” Steve Crosby, Chairman and CEO of SmartRoute Systems, said. “We are poised to take a dominant position offering traveler information throughout the Northeast Corridor, and to offer unique content for the rapidly proliferating multimedia delivery mechanisms to home, office, and vehicle. 21st Century, Wheatley Partners, and Gabelli Multimedia Partners are national leaders in identifying emerging companies and new technologies. For them to decide to invest in SmartRoutes is a vote of confidence in our ability to execute our aggressive business plan.”

For Release: Sept. 24, 1996
Contact: Dominic Slowey
(617) 742-7077
Katy Miller
(617) 494-8100

**SMARTROUTE SYSTEMS TO LAUNCH "SMARTTRAVELER" INFORMATION SYSTEMS
IN WASHINGTON, NEW YORK CITY, AND PHILADELPHIA**

Cambridge, MA -- SmartRoute Systems, through unique public-private ventures, is launching its SmarTraveler commuter information system in three new East Coast cities -- making it the dominant provider of traveler information services throughout the entire Northeast Corridor.

SmartRoutes, which currently operates in Boston and Cincinnati, recently won three separate contracts to build Advanced Traveler Information Systems (ATIS) in Washington, D.C., New York City, and Philadelphia to aid travelers by providing them with real time traveler information services through a variety of electronic media. Under these contracts, SmartRoutes will privately finance the construction and operation of the ATIS systems, and will sell the traveler information collected to both public and private entities for use by the general public.

The SmartRoutes announcement comes a week after the company closed a major financial transaction with 21st Century Communications Partners, L.P., Wheatley Partners, L.P., and Gabelli Multimedia Partners that provided a \$7 million capital investment in the firm.

"Winning these three contracts provides us with a tremendous opportunity to show how a private company with a mix of public and private financing can provide the public with unparalleled services -- services that will save them time as commuters and money as taxpayers," Steve Crosby, Chairman and CEO of SmartRoutes Systems, said. "It is a public-private partnership in its purest sense."

"Moving into the Washington D.C., New York, and Philadelphia markets puts SmartRoute Systems in a unique position to offer unrivaled, real-time traveler information to markets throughout the Northeast Corridor, representing almost 20 percent of the U.S. market," Crosby said. "Our next round of financing will enable us to complete the launch of SmarTraveler services in the 30 largest U.S. cities."

SmartRoutes collects, processes, and delivers a broad range of traveler information to consumers through existing and evolving electronic media, including cellular phone, on-line services, paging devices, landline telephone, and cable TV. SmartRoutes is most widely recognized for its SmarTraveler audiotext service, a state-of-the-art Advanced Traveler Information System (ATIS), which disseminates real-time, route-specific traffic and transit information.

-more-

Under the terms of its unique public/private financing model, the Intelligent Transportation Partnership Structure (ITPS), SmartRoutes invests an average \$2 million in the deployment of a fully-operational data collection and management system in each market the company enters. This includes a fully staffed Traffic Operations Center, and numerous stationary and rotating video cameras, which provide real-time information that is processed through SmartRoutes' proprietary traffic management software. This data, which is combined with information from electronic sensors, mobile probes, in-flight monitors, public highway and mass transit sources, and much more, is then available for dissemination through both public and private channels of communication.

On the public side, SmartRoute Systems, under contract to participating state agencies, makes the information available to the public free of charge in various media formats, including the SmarTraveler telephone service. Participating public agencies are then entitled to a percentage of the proceeds from SmartRoutes' sale of the data to private companies.

SmartRoutes will use a portion of the recent \$7 million investment in private financing to build the Advanced Traveler Information Systems for the three cities.

In Washington, D.C., a SmartRoutes team, led by Battelle Memorial Institute, will build a range of Intelligent Transportation Systems (ITS) for the National Capital Region Traveler Information Showcase (NCRTIS), a multi-year agreement with the Virginia Department of Transportation, representing 25 D.C.-area transportation agencies. SmartRoutes will begin building the Washington D.C. traveler information system in September; it is scheduled to be operational in February.

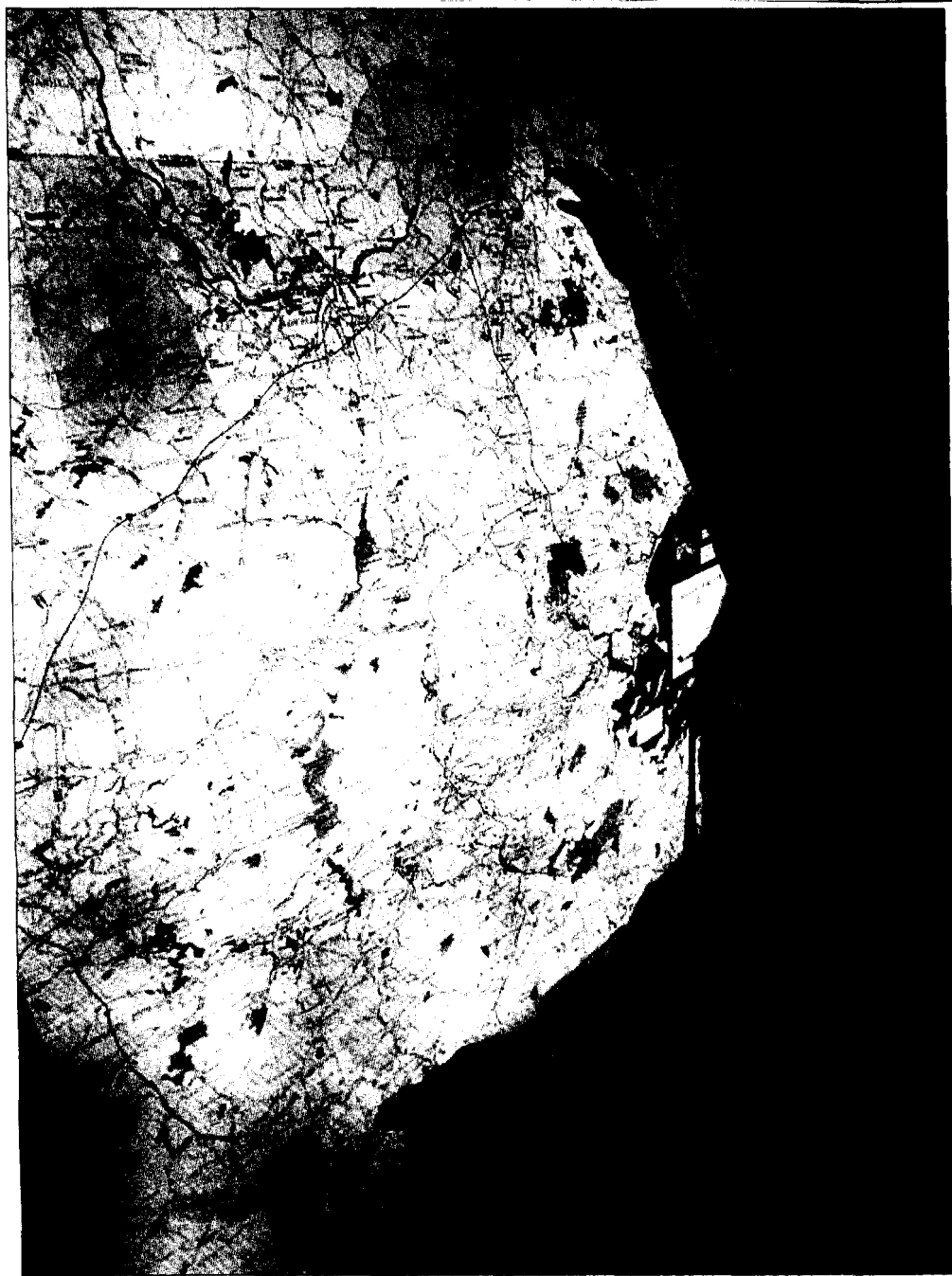
Similarly, in New York City, SmartRoutes was part of a winning team, led by Lockheed Martin, recently chosen by the New York State Department of Transportation to build an ITS network, as part of a federal initiative to showcase ATIS in five markets around the country. SmartRoutes traveler information system will be operational by mid-1997.

In Philadelphia, SmartRoutes has been selected by the Pennsylvania Department of Transportation to provide traveler information systems for the Philadelphia-Southern New Jersey metropolitan area. Operations are scheduled to begin in early Spring 1997.

"In the SmartRoute Systems public-private partnership model, the private sector incurs all start-up, system development, and operating costs, while the public sector receives services for a fee, which is then partially offset by a revenue sharing agreement," Crosby said. "We believe this financing mechanism sets a new standard for the term public-private partnership."

Business

THE BOSTON GLOBE • THURSDAY, SEPTEMBER 12, 1996



GLOBE STAFF PHOTO / DAVID L. RYAN

SmartRoute Systems chief executive Steve Crosby wants to expand the small Cambridge company's services to the top 30 US cities.

Next stop, United States

BOSTON CAPITAL



STEVE BAILEY
STEVEN SYRE

SMARTROUTE SYSTEMS INC., WHICH CUT its teeth on helping commuters run the gauntlet that is Boston traffic, has a big new slug of money and has won approval to set up similar high-tech systems in New York, Washington and Philadelphia.

The \$7 million in new capital from three investment firms is a big leap forward for the little Cambridge company, which until now has been financed with about \$4 million from individual investors and the partnerships it cut with state transportation departments.

The new investors are led by 21st Century Communications Partners, along with Wheatley Partners and Gabelli Multimedia Partners, firms that specialize in multimedia and

With new cash and approvals, SmartRoute eyes expansion

approvals and federal subsidies worth about \$10 million a year to build traveler information systems in three big East Coast cities similar to ones it now operates in Boston and Cincinnati. Steve Crosby, SmartRoute's chief executive, says his company will be part of a team in Washington, which expects to be in operation in the first quarter of 1997, and another consortium in New York, which should be running by midyear. Philadelphia should also be operational by the first quarter.

Founded in 1988 by a former Hewlett-Packard Co. engineer, SmartRoute hopes to provide traveler information through a variety of channels — from cable TV to the Internet

in much the same way that others have sold weather data. The key question: Who will pay for it, and how much will they pay?

"I think it is something that commuters will pay for," said Francine Sommer, a general partner in Gabelli Multimedia, one of the new investors. "What they will pay, I don't know."

SmartRoute gathers its data using video cameras and an army of travelers it has equipped with cellular phones. In Boston, where the service is underwritten by a \$1.5 million annual subsidy from the Massachusetts Highway Department, users can call 374-1234 or *1 on their cellular phones for free traffic information.

Traffic problems, like the weather, can change fast, and SmartRoute has taken its lumps on the reliability of its reports. But call volume has continued to mount, growing to more than 250,000 calls a month in August from less than 50,000 in early 1993, according to the company.

Early on SmartRoute tried and failed to sell its service to individuals and companies. Today 75 percent of its \$8 million in revenues come from subsidies from state transportation departments, which are looking to push more traffic, more efficiently through current highways rather than build expensive new ones.

The company has almost 100 employees and expects to add more than 50 in the expansion. Crosby says SmartRoute has been running at break-even on an operating basis for about a year; revenues should jump to \$15 million next year, he said.

Where SmartRoute sees its biggest opportunity is as part of the new technology that is equipping fleets of commercial vehicles with devices that will provide drivers with traffic information and directions to their destinations. Earlier this year the company signed a deal to provide service to Geotek Communications Inc., a New Jersey wireless and communications company that is developing such a network.

SmartRoute's information is also available through the commercial online service America Online.

Crosby, 51, who in his previous lives worked for politicians such as Francis Sargent, Kevin White and Margaret Heckler and ran a company that published cable TV guides, says SmartRoute will need another big round of financing within 18 months if it is to expand to the top 30 US cities as it plans. The costs of installing the SmartRoute system in an average big city: \$2 million.

That will mean a public offering or finding a partner with very deep pockets, Crosby said.

Business

THE BOSTON GLOBE • WEDNESDAY, MARCH 6, 1996

SmarTraveler goes cyber in deal with AOL

By Thomas C. Palmer Jr.
GLOBE STAFF

CAMBRIDGE – Starting today, you may want to go on line before going out the door.

SmartRoute Systems Inc., which offers current traffic and MBTA information by telephone through a service called SmarTraveler, is joining up with America Online to give commuters nationwide another way to find out where the tieups are.

SmarTraveler will now be available on your home or office personal computer, with text, click-on map and nearly instant video pictures of the routes in the Greater Boston area that you want to take – or avoid.

“Over the next few months there’s going to be an explosion of our private-sector partners,” said Stephen P. Crosby, chairman of SmartRoute Systems, which has previously been best known for its partnership with the state highway

department.

America Online is scheduled to announce the availability of travel information today as part of its introduction of Boston as a so-called digital city.

AOL, the nation’s largest commercial on-line service, has begun to offer information about entertainment, business, sports and events in several specific localities in its Digital City concept. Locally, similar services are available through boston.com, an Internet service developed by The Boston Globe’s electronic publishing subsidiary. However, an America Online spokeswoman said its service was not intended to compete with locally-based services.

Separately, SmartRoute Systems, based in Cambridge, said yesterday it will team up later this month with Geotek Communications Inc., a hot new wireless communications company based in New Jersey, to sell in-vehicle communications and information services to firms with small and medium-sized fleets.

Shoobox-sized units with TV-like screens and phones will be attached to dashboards of vehicles, whose drivers then will receive current information on traffic and weather conditions and directions to their destinations, and airline schedule updates.

John Rourke, vice president of business development for SmartRoute, said the how-to-get-there? service will be available within six months on America Online. Type in the addresses of where you are and where you’re going, hit “enter,” and up pops a map of the best route, and a text version of directions, including each turn you have to make.

SmartRoute just began its fourth year of a partnership with the Massachusetts Highway Department, which pays the company \$1.5 million annually to collect and provide its traffic information. It is a piece of the so-called intelligent transportation system’s future that is being encouraged by the US Department of Transportation.

The on-line SmarTraveler information will be available on the World Wide Web from America Online, from the SmartRoute Systems home page (<http://www.smartroute.com>) or from Boston.com (<http://www.boston.com>). Users will have access to text describing traffic conditions on 32 specific routes or portions of roads within Route 495, and they will also have access to pictures of actual conditions from 60 SmartRoute cameras.



John Rourke, vice president at SmartRoute.

GLOBE STAFF PHOTO WENDY MAEDA

Eventually, SmartRoute managers said, drivers will not even have to call SmarTraveler to be forewarned. Through an automatic vehicle location device now being developed, the system will sense trouble ahead on a crowded highway.

“It will tell you if you are about to go into a five-mile backup,” Rourke said. Likewise, information on available parking and ride-sharing will be available. SmarTraveler is reached through a *1 cellular-phone call or by calling 374-1234.

Meanwhile, Geotek said it raised \$115 million in capital from Soros Investment Partnership and CIP Capital, a venture capital company managed by Geotek’s chairman Winston Churchill. Geotek stock rose 1/4 to 11 1/8.

The company estimates there are 66,000 firms each with at least five vehicles in Eastern Massachusetts that could use Geotek’s service.

THE URBAN TRANSPORTATION MONITOR

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VOL 10, NO 6

MARCH 29, 1996

Automated Traveler Service in Boston Expands To Internet, Wireless Network

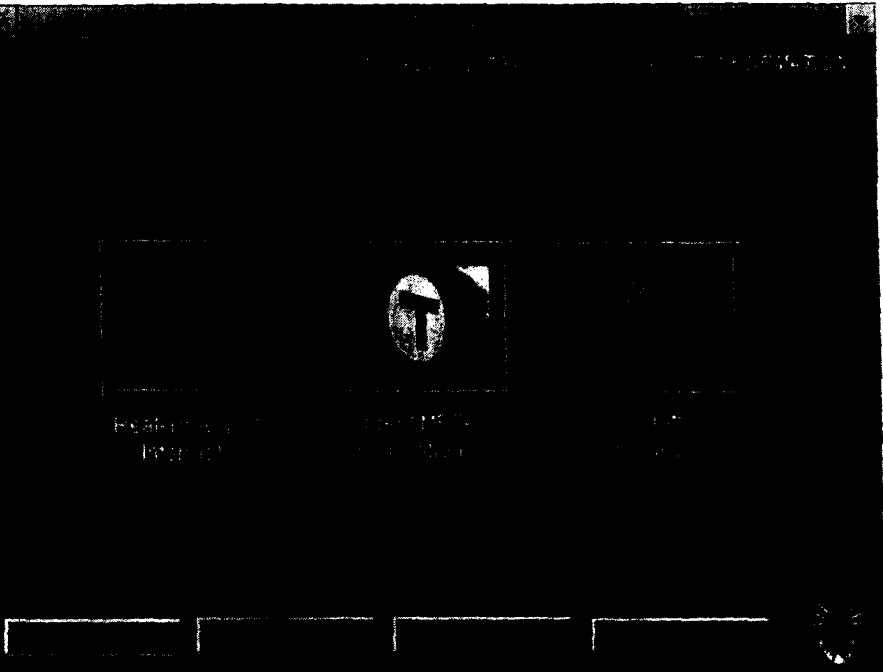
Will Provide Dynamic Route Guidance

Real-time, route specific traveler/computer information is expanding to the internet and to a wireless network in Boston. The free SmarTraveler audiotext service is currently sponsored by the Massachusetts Department of Transportation and is provided by SmartRoute Systems.

SmartRoute Systems has arranged for America Online (AOL), the U.S.'s largest on-line service, to provide traffic and transit information to AOL members through "Digital City - Boston." AOL members will be able to point-and-click to read current traffic conditions for the route they choose, and see camera images of major congestion choke points on roads throughout Greater Boston.

The SmarTraveler audiotext service is currently accessible from any touch-tone telephone (374-1234 or *1 on cellular) and has been a success for commuters in eastern Massachusetts. In January of this year, the SmarTraveler audiotext service handled 344,059 calls, an increase of 235% over the same month last year.

SmartRoute Systems also has



SmarTraveler on America Online.

teamed up with Geotek Communications, Inc., a wireless communications company, to develop enhanced information services. The intent of this venture is

to provide Geotek's mobile users with a broad array of SmartRoute Systems traveler information, which includes route specific traffic conditions, turn-by-turn street directions, actual airline arrival and departure times, and dynamic route guidance, among other services. The initial target market that the companies will pursue is commercial vehicle operators that have dispatch centers and fleets of vehicles on the roadways. The service will be offered in Boston beginning in April and will expand to new cities. Geotek estimates the current market for its services will be the more than 2 million small and medium sized businesses operating 27 million vehicles nationwide.

SmartRoute's integrated voice and data services will be accessed through the Geotek Mobile Workstation, the first device to combine the features and functionality of a cellular telephone, pager, two-way radio, and mobile data terminal into one platform.

For more information, contact John Rourke at (617)494-8100, fax (617)494-

March 25, 1996

INSIDE

Intelligent Transportation Systems Update for North America

SmarTraveler Info on Geotek Boston Network, Navigation Promised

Geotek network initially will offer voice service only, but data to be added later. SmartRoute plans to offer route guidance and expand with Geotek into other markets. GPS capability will make new features available.

The SmarTraveler traffic information service offered for several years by SmartRoute Systems in the Boston area will soon be offered on a new wireless communications network from Geotek Communications in Montvale, N.J. (see *Inside ITS*, March 11, 1996). Geotek plans to activate its new network in Boston this spring, using it to provide fleet management services to small- and medium-sized companies. Initially the SmarTraveler service available via Geotek will be the same audiotext service currently available over telephones. But the two companies are charting ambitious enhancements that include text messaging and route guidance.

The Geotek network operates on the specialized mobile radio (SMR) band in the 900 MHz range, using a proprietary frequency hopping multiple access

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\$336.8 M FY97 ITS Request Pushes Deployment Efforts

DOT devotes more than a third of its ITS budget to activities aimed at mainstream deployment of ITS. Requests for R&D, operational tests strikingly lower than last year's. Overall ITS request also slightly lower than the one submitted a year ago.

Following through on declarations that it plans to emphasize mainstream deployment of ITS, the U.S. federal ITS program has devoted more than a third of its fiscal year 1997 budget request to activities connected with its Operation Timesaver initiative (see *Inside ITS*, Jan. 15, 1996). The U.S. Department of Transportation (DOT) requested a total of \$336.76 million for ITS as part of the Clinton Administration's FY97 budget, released last week.

Of that, \$100 million would be devoted to ITS model deployment, and \$21.75 million to a new budget category called "mainstreaming." Together, these two categories make up 36.15 percent of the ITS budget.

The request for model deployment funding echoes last year's attempt to secure \$100 million for a program called Operation Trailblazer. The DOT has swapped "Trailblazer" for the less romantic-sounding "Timesaver," but the aim of the program is the same. This is to deploy integrated suites of ITS technologies in selected locations, to serve as shining examples encouraging public and private entities to make similar

investments elsewhere.

Transportation secretary Federico Pena has said the goal of Operation Timesaver is to implement an intelligent transportation infrastructure (ITI) in the top 75 U.S. metropolitan areas. The DOT's efforts toward mainstream deployment particularly emphasize applications for traffic management, traveler information and commercial ve-

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Consumers rate location-based calling services.

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SmarTraveler Info on...

Continued from page 1.

(FHMA) system. The technology was developed in conjunction with the RAFAEL division of the Israeli Defense Ministry, says a Geotek spokesperson.

The first Geotek network to be activated commercially was in Philadelphia in January; it currently has 100 customers (see sister publication, *Logistics Technology News*, Feb. 16, 1996). A second network saw the start of commercial operations in the Baltimore/Washington, D.C. area at the end of February. Geotek plans to make its service commercially available in 36 markets by 1997. Its two networks currently offer voice service only, but trials are being conducted with data applications, the spokesperson says.

SmarTraveler has offered real time, route specific traffic and transit information in the Boston area since 1991.

The information is collected through an extensive surveillance system and is delivered through a telephone audiotext system. A second SmarTraveler service was set up in the Cincinnati area in 1994 (see *Inside IVHS*, Jan. 30, 1995). While the traffic information on the Geotek network initially will be delivered in the audiotext format as well, when Geotek makes data capability available, SmartRoute will make use of it to send text messages also.

SmartRoute Systems has not previously offered route guidance services. However, "SmarTraveler from the beginning has been a product that will accommodate a broad range of travel information services. And route guidance has always been part of that vision," says John Rourke, vice president for private sector business development at SmartRoute.

SmartRoute will soon announce an alliance with one of the major map database providers for route guidance, Rourke says. When SmartRoute factors real time traffic conditions into the route guidance database, "that's when the power of all this technology truly comes out," he says. The new capability will become a reality "sometime this year," he says.

"Route guidance has always been part of that vision."

Boston is the first market where Geotek will offer traffic information. Although it is one of only two markets where SmartRoute offers the SmarTraveler service, both companies are looking to expand the service to additional markets. Other traffic information providers are already operating in cities where Geotek plans to activate networks. But "Geotek is working with SmartRoute and planning on SmartRoute also coming up and being available in cities where Geotek is building up its networks," says the Geotek spokesperson. This means SmartRoute will have to become available in other cities at a high rate of speed.

"SmartRoute has a very aggressive expansion plan going forward over the next three years," says Rourke. The company will soon announce new cities where it expects to offer service, he says. It takes "about five months" to create a SmarTraveler service in a new city, he says. The money for the expansion will come "through new contracts as well as a significant capital infusion that you'll be hearing about in the near future," he adds.

"SmartRoute will be providing other forms of content which our end users are quite enamored with."

The end user receives information in the vehicle on one of two hardware options that Geotek offers. The enhanced mobile workstation (EMW) includes a telephone handset and a 5 inch by 5 inch screen mounted on a pedestal. Options will include a global positioning system (GPS) receiver, an external speaker, a hands-free microphone and a push-to-talk switch. Geotek says that when the EMW is fully developed it will combine two-way radio communications, messaging, wireless telephony and data transmission. "You have something that borders on a mobile computer with voice capability," says Bill Opet, Geotek's senior vice president of marketing.

Geotek's other platform is a handheld unit, the integrated mobile workstation (IMW). Like the EMW, it provides voice dispatch communications and telephony, it can be linked to a computer for data transmission, and it can receive and store messages. The display screen, however, is smaller than the EMW's—about the size of the screen on an alphanumeric pager. The SmarTraveler information will be available on both units.

Mitsubishi Electronics USA manufactures the EMW, and Hughes Network Systems manufactures the IMW.

Canwood is designing a second generation version of the EMW. Geotek is working with a yet-unannounced company on a GPS automatic vehicle location (AVL) system, the spokesperson says.

The Geotek service will be sold through a dealer network. The suggested cost for the hardware, including installation, is \$1,200-\$1,300, with the EMW unit priced at the lower end of that range and the EMW at the higher end. Monthly service plans for telephony and voice dispatch range from \$39-\$79. SmarTraveler is considered an "enhanced service"; prices for those services have not been announced.

In the future, "SmartRoute will be providing other forms of content which our end users are quite enamored with and very interested in seeing come about," says Robert Leland, market director for Geotek in Boston. Reliable information on airline arrivals and departures is one of the promised features that is important to limousine services, he says. If a limousine company has access to updated arrival times, it can avoid losing time while drivers wait for passengers at airports. Route guidance is important to limousine fleets and other businesses that don't serve the same clients all the time, such as courier companies.

As the system goes forward and incorporates GPS, it will be able to be more proactive with events management, Leland says. "If we know where an accident is and we know where the vehicle is, the two can be tied together." Customers can then be alerted if a traffic event has occurred, even if they have not called in a request for information.

The alliance with Geotek follows close on the heels of SmarTraveler's incorporation into "Digital City - Boston" on the America Online computer network (see following story). SmartRoute will soon announce other new developments in the private sector; SmarTraveler will be offered on its current platforms in additional markets and on new platforms, Rourke says. Besides the phone access, SmarTraveler was previously offered on an alphanumeric paging service in the Boston area. That service was withdrawn after it failed commercially (see *Inside ITS*, March 11, 1996).

Geotek has spent over \$300 million in the past four years building its networks, says the company spokesperson. One of the major investors is the Soros Group, which has invested \$100 million. In the first half of 1996, Geotek plans to activate commercial networks in New York, Miami and Dallas.

A S U P P L E M E N T T O

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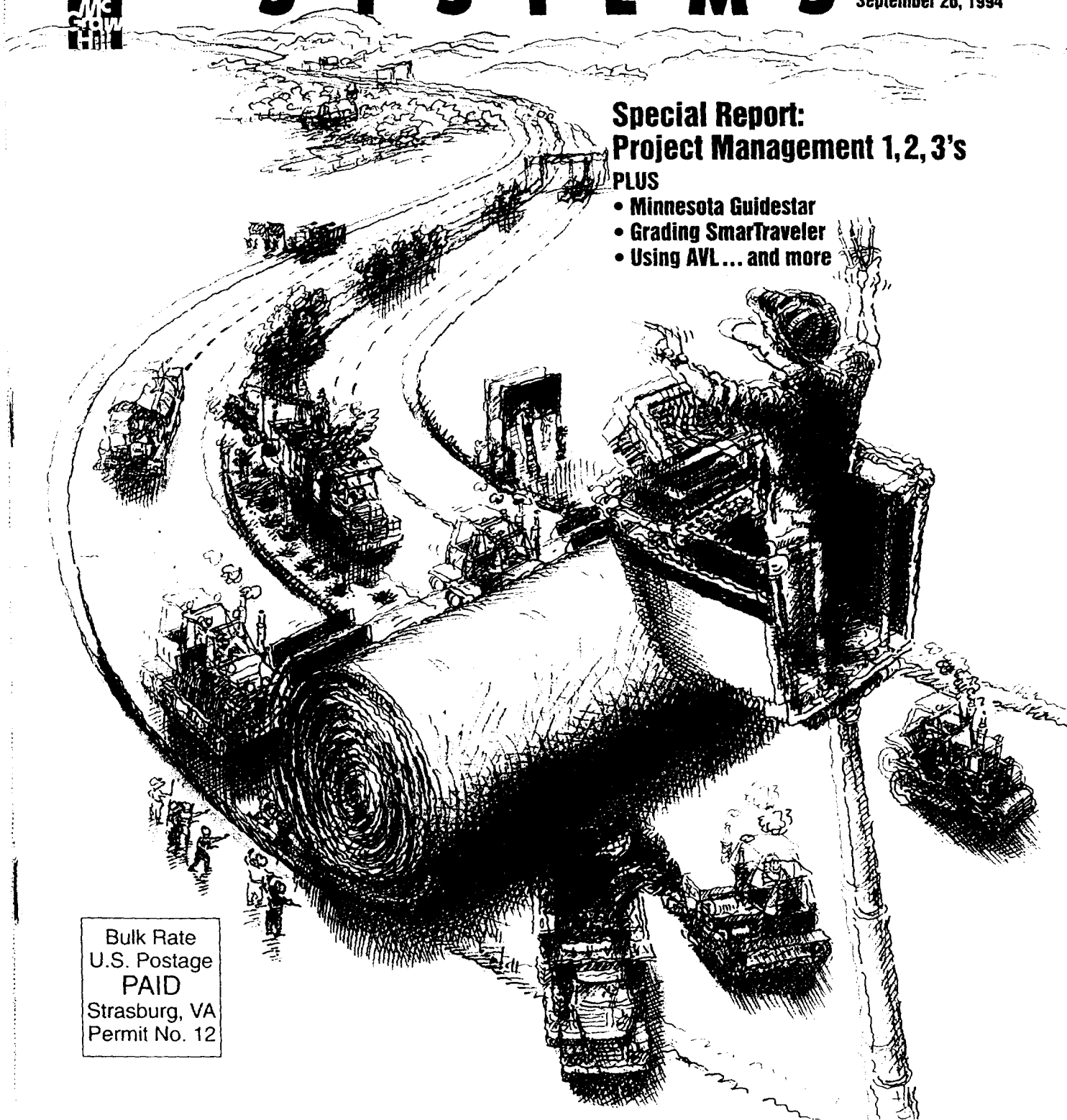
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- Minnesota Guidestar
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LEARNING ABOUT THE SMART TRAVELER

by Stephen P. Crosby

During the past three years, nearly \$320 million have been allocated and expended by two Administrations and congress for Intelligent Highway Vehicle Systems (IVHS) investment. Fully one third of those dollars, in excess of \$100 million, has been invested in the Field Operational Test (FOT) program, a well-conceived effort to demonstrate new technologies ready for deployment, in anticipation of at least some of those FOTs leading to prompt deployment of significant components of the overall IVHS infrastructure.

Critics have argued that excessive congressional earmarking has hamstrung the creativity and objectivity of the FOTs and that too much of the FOT investment has focused on, in effect, research and development of technologies far from widespread deployment.

In a balanced view of the IVHS program, such criticisms have their place. However, the US DOT's rather modest investment in IVHS has proven to be a remarkably successful transportation

and industry policy. Guided, in substantial part, by its unique quasi-private strategic planning arm, IVHS America, the Department of Transportation has orchestrated the development of an IVHS industry nearly equal to that of its major competitors in Japan and Europe.

Whatever its shortcomings, the FOT program, particularly, has many accomplishments:

- It has induced most of the major defense contractors to look to IVHS for a significant commercial conversion opportunity.
- It's induced significant private sector contribution to IVHS research and testing, probably to the tune of at least 100% matching dollars to the federal investment overall.
- It's attracted participation of nearly half the state Departments of Transportation in the design and/or operation of Operational Tests, thus greatly increasing the sensitivities of those road construction-oriented agencies to the benefits of IVHS technologies.
- It's induced the involvement of a wide variety of telecommunications and consumer products companies in the research and testing of various technologies, at least some of which have the realistic potential of immediate deployment.

SMARTER ROUTES. This article focuses on the SmarTraveler Field Operational Test, which represents several of the most positive principles established by and for the program. SmarTraveler is an Advanced Traveler Information System (ATIS) offering free, real time, route specific traffic and transit information to anyone with a touch-tone phone. The SmarTraveler coverage area includes 1,400 square miles and 122 cities and towns in eastern Massachusetts.

The SmarTraveler FOT was funded 50/50 by federal IVHS funds and non-IVHS contributions, with most of the

non-IVHS share coming from the private sector.

The SmarTraveler FOT has been extensively evaluated by an independent contractor, Multisystems, Inc. of Cambridge, Massachusetts, on behalf of the Massachusetts Department of Transportation and FHWA.

The SmarTraveler FOT has been continued for an additional year by FHWA and the Massachusetts Department of Transportation.

SMART GOING. The SmarTraveler Field Operational Test was originally conceived at a meeting between SmartRoute Systems and Norm VanNess, then head of Traffic Operations and IVHS at the Federal Highway Administration. SmartRoute Systems and Van Ness agreed that a great deal of the IVHS focus was on the technology of data collection, data fusion, and data delivery systems—while little if any focus was being paid to the issues of consumer acceptance of advanced traveler information, and the impact that such advanced traveler information might have upon traveler behavior.

Van Ness and Steve Lockwood (then associate administrator for Policy at FHWA and now a vice-president at Parsons Brinkerhoff) speculated that for many metropolitan areas and for at least certain IVHS functions, it was possible that the privately-maintained and cost effective data collection infrastructure designed by SmartRoute Systems might be adequate, and that in any event, testing consumer acceptance of advanced traveler information was a critical component of the Field Operational Test program.

At the time the SmarTraveler FOT began, SmartRoute Systems in Cambridge, Massachusetts, had already developed and begun operations of a

Exploring routes with on-line callers.

SmarTraveler call counts January 1993-July 1994

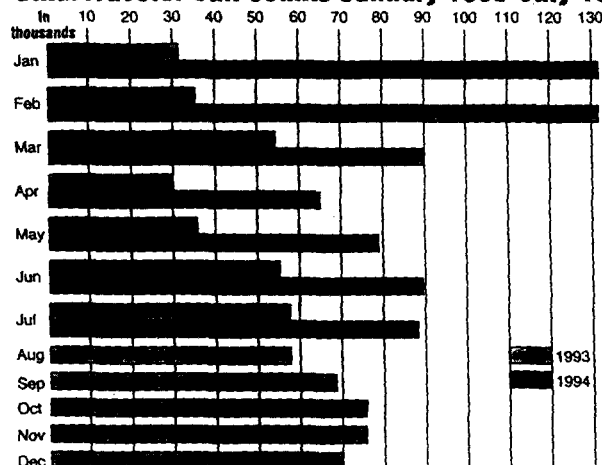


Photo by Jeff Larson

fully-private Transportation Information Center. This operation was designed to collect, manage, and disseminate traveler information through a broad range of existing and soon-to-be-developed electronic media.

At its operations center, up-to-the-minute information is gathered and maintained for 701 miles of major roadways in eastern Massachusetts as well as for bus, rapid transit and commuter rail lines at the Massachusetts Bay Transit Authority (MBTA).

Using a data collection matrix from the high tech to the prosaic, SmartRoutes designed the surveillance methodology for all road segments, which included 500 daily mobile probe trips; 50 live and slow-scan cameras located at critical congestion spots around the region; one to three aircraft covering the portions of the metropolitan area outside the traffic control area; direct "hotline" links to all Massachusetts transportation agencies, including the State Police; and a comprehensive database of "static" information about construction and other predictable activities, which account for as much as 30% of congestion, according to FHWA studies.

Using highly-trained Traffic Managers as a focus for fusing multiple data collection sources and interpreting real-time data for useful dissemination to the public, real-time and static data is then prepared for telephonic delivery in a Unix-driven, Ethernet-link, multi-node, multi-port, audiotext system.

The system possesses a proprietary management operating overlay designed by SmartRoutes' founder, John Liebesny, and detailed by Micrologic, Inc. of Waltham, Massachusetts, the principal designers of the LoJak Vehicle Recovery System. The SmartRoute Systems' configuration incorporates Intel 80386/486-based PC multi-tasking and disk mirroring technologies to provide the capability to update traffic information on an instantaneous basis, with no interruption in the ability of customers to call in and access the information.

The system, which is scalable, had the capacity to provide 6,000 callers per hour with up-to-the-minute traffic and transit information, at the time the SmartTraveler FOT was envisioned.

HOW THE SERVICE IS USED

Results of the recently completed study conducted by Multisystems, Inc. and GPS were published with findings from the first 15 months of operation of the SmartTraveler ATIS.

In a survey of over 2,000 callers to the SmartTraveler service, querying those users on their reactions to the information received from their most recent call to SmartTraveler, an independent evaluator found the impact of the service on traveler behavior to have manifested the following ways:

- 48% of respondents reported immediately they reacted in one of the following ways:
 - 18% reported changing route or mode of travel
 - 11% reported using a different route
 - 23% reported canceling the trip
 - 14% reported changing route and time
 - 19% indicated they used the information to choose a different mode of travel

Most of the remaining callers in some way used the information they received to modify their travel. A smaller number of callers indicated they reported they would use the information to make a decision based on the information they received.

HOW THE SERVICE IS PERCEIVED

An independent evaluation of the SmartTraveler ATIS indicates that users' satisfaction of SmartTraveler's quality, accuracy, and timeliness was high in their day-to-day travel.

- 77% of users agreed or strongly agreed that the service was useful.
- 80% rated the service as "very good" or "excellent."
- 70% reported reduced frustration as a result of using the service.
- 67% indicated that SmartTraveler provided all types of information they desired from a traveler information service.
- 64% reported the service was easy to use.
- 61% reported that it was easy to use.
- 52% reported that they were able to make a decision based on the information they received.

Under the sponsorship of the Massachusetts Department of Transportation and the Massachusetts Highway Department (MHD), the SmartTraveler operational test began offering up-to-the-minute advanced traveler information to everyone in eastern Massachusetts with a touch-tone telephone in January 1993, free-of-charge. The critical variables in measuring the success of the service and the FOT were:

- Whether travelers could be induced to use the service;
- Whether travelers who had used the service were satisfied with it and would reuse it; and
- Whether use of the service impacted on the users' traveling behavior, in time, route, or mode of travel.

GAUGING SUCCESS. Although there have been criticisms of the FOT program for the standards and rigor of the evaluation component, both FHWA and the Massachusetts Department of Transportation required a comprehensive, independent evaluation of the SmartTraveler FOT, executed by the Central Transportation Planning Staff (CTPS), technical staff to the Boston MPO, and Multisystems, Inc.

Early experience with the use of the

SmartTraveler ATIS demonstrated that teaching travelers the behavior modification of accessing "intelligent traveler information" before or during their travel is a substantial challenge that will have to be faced by the entire IVHS industry; and that an accurate, useful Advanced Traveler Information Service will be used by travelers, both in and out of their cars, and that usage will grow methodically.

The SmartTraveler ATIS, at present, is servicing 1.5 million callers annually, and usage in its second year of operation is running 160% ahead of usage in its first year. One lesson learned from the SmartTraveler FOT is the critical importance played by advertising for the service, interagency support for the service, public sector sponsorship of the service, and the need for support from the landline telephone providers.

IMPACT ON VEHICLE EMISSIONS.

The evaluation of the SmartTraveler ATIS substantially confirmed certain key points of focus group research independently conducted by SmartRoute Systems for an Early Findings Report, evaluating the impact of SmartTraveler on users' route, time or mode of travel. Using this data, SmartRoute Systems retained Tech Environmental, Inc., of Waltham, Massachusetts, a firm recommended by the Massachusetts Environmental Protection Agency, to assess the potential impact on air pollution of the SmartTraveler ATIS in the Metropolitan Boston Non-Attainment Area.

Based on projections of increased use of the SmartTraveler service by SmartRoute Systems, the Tech Environmental report concluded that widespread use of SmartTraveler could account for the elimination of nearly one-half ton of Volatile Organic Compounds (VOC) daily.

This would account for 1/2 percent of the total required reduction in VOC from the base year 1990 to the target compliance year of 1999, and almost 7% of the projected requirement from new Emission Reduction and Highway Operations, Transportation Control Measures (TCM) that remain to be implemented.

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HOUSTON Continued from page 25

interference and to compile different data. The tags from the toll road, though, will continue to be read by the AVI antennas used for traffic monitoring on Houston's other highways. An additional 3,200 tags are being issued by TxDOT for Phase II, scheduled for completion in fall 1994. An additional 52 readers and 288 antennas are being installed on the highways and adjacent HOV lanes. One strategy is to provide tags to key commercial users who use the road frequently and whose patterns need to be monitored.

The final phase of the project is scheduled for completion by summer 1995. Phase III will complete the AVI system on Houston's radial highways, all HOV lanes, the rest of the I-610 loop and the Sam Houston Tollway. City buses will be among the vehicles receiving an additional 2,500 tags during this phase of the project. Readers will be placed at the entrances and exits of the HOV lanes to provide vehicle location and bus scheduling services, and additional roads with heavy bus traffic will be supported in the AVI system to facilitate city bus routing.

DELIVERING INFORMATION. Data collected with the AVI system is used by various transportation agencies to analyze the effect of traffic management strategies and to assist in the development of new programs.

Real-time data also allows control center operators to change the variable message signs along the highway to inform travelers of current travel conditions and possible down-the-road incidents.

As an ATMS, one of the five IVHS initiatives, the system can help provide travel times, surface conditions and alternate route information to drivers through the sign boards or radio broadcasts. Delivering vital traffic information directly to commuters has proven to be more timely and accurate.

Information on HOV lanes, for example, may be the most critical data compiled by the central control facility. If speeds on the HOV lanes drop to less than 40 mph, TTI recognizes instantly there is a problem that must be addressed immediately. Comparing and contrasting the travel time on the HOV lanes to the travel time on the other highway lanes, where average rush-hour speeds approaching 40 mph are often just a fantasy, is another value to the AVI system.

As these comparisons are relayed to commuters, the number of drivers choosing to use the HOV lanes may increase, reducing the overall amount of vehicles on the road. An AVI system

on HOV lanes also can be used to monitor and enforce authorization.

In the future, information gathered from the traffic monitoring system will be available to commuters in their vehicles, homes or offices, where travel decisions and routing can be made in advance. Travelers may receive the same display the TTI monitors in the central control facility. For commuters who access the traffic information, custom displays of routes—a feature called Smart Commuter—will be available.

Overall, the entire project is designed to enhance mobility, reduce travel time and cost, increase travel safety and improve environmental effects.

ADVANCED TRAFFIC MANAGEMENT. Other metropolitan locations in the U.S. have studied and tested AVI systems for use in monitoring and managing traffic. Compared to traditional loop-sensor systems, AVI systems such as the one developed for the Houston ATMS can be installed faster with little or no traffic interruptions, and have proven to be more accurate and dependable. And, as other demands are made for traffic management, the AVI system in Houston will be adapted and upgraded.

The use of the current system in conjunction with additional traffic management systems, including closed-circuit television monitoring, will enhance the capabilities of the central control facility. Incident assessment and emergency vehicle routing are two areas that will be affected by advances in the monitoring system.

TTI also will be capable of tracking vehicle movements from one roadway to another, which will improve monitoring of traffic patterns. With increased pattern monitoring, traffic flow programs can be developed to improve traffic efficiency. And while the AVI system in Houston uses basic identification equipment, future modifications may be made to include read-write communications, bringing traffic information into the vehicle.

With the system more than halfway installed, the project has proven to be beneficial for all involved—public agencies, private companies and highway travelers. The informal partnership created by the public and private sectors has facilitated the gathering of accurate information on traffic congestion and increased their knowledge and understanding of traffic flow in the metropolitan area.

While commuters on I-10 in Los Angeles and Jacksonville still fight congestion every day, drivers using I-10 in Houston are helping ease the daily commute in the future.

IHS
FRANK DORRANCE is director-IVHS programs, Amtech Systems Corp.

TRAVELER Continued from page 27

FUTURE IMPACT. The IVHS Program gestated and managed by the U.S. Department of Transportation and the United States Congress is constrained and defined by the same pressures of budget, politics and—more uniquely—technology that constrain and define all the major public policy initiatives of our time.

But within these constraints, the IVHS initiatives of US DOT and Congress under the stewardship of Senators Moynihan and Lautenberg and Representative Carr, surely have as much potential to enhance American competitiveness, produce jobs, improve the mobility of goods and services, and reduce the deleterious environmental impact of vehicle miles traveled as any other major public policy initiative of the past 50 years.

IHS
STEPHEN P. CROSBY is chairman of SmartRoute Systems, Inc., based in Cambridge, Massachusetts. SmartRoute Systems designs, develops and operates Advanced Traveler Information Systems.

CALENDAR

OCT 5-7. ATMS Meeting, San Antonio, TX. Contact IVHS America, Bo Strickland, 202/366-1993

OCT 11-13. GovCom '94: The Government Computer and Networking Forum, Washington Convention Center, Washington, DC. Contact Reed Exhibition Co., 301/495-7100 or 800/7GOVCOM (*Editor's Note: This show is being held in conjunction with Interchange '94: The Summit of the Intergovernmental Enterprise*)

OCT 11-13. Interchange '94: The Summit of the Intergovernmental Enterprise, Renaissance Hotel and Washington Convention Center, Washington, DC. Contact Reed Exhibition Co., 301/495-7111 (*Editor's Note: This show is being held in conjunction with GovCom '94: The Government Computer and Networking Forum*)

OCT 23. IVHS Planning Committee, Troy, MI. Contact IVHS America, Doug Robertson, 202/484-2898

OCT 24-25. IVHS America Coordinating Council Meeting, Troy, MI. Contact IVHS America, Bonnie Jessup, 202/484-2896

OCT 31-NOV. 3. Photonics for Industrial Applications, Hynes Convention Center, Boston, MA. Contact The International Society for Optical Engineering, 206/676-3290

NOV 1-2. Federal Imaging 1994: The Document Management Conference and Exhibition. Contact Reed Exhibition Co., 301/495-7100 or 800/354-4003

NOV 29. IVHS America Board of Directors Meeting Hotel Concorde Lafayette, Paris, France. Contact IVHS America, Bonnie Jessup, 202/484-2896